

**FIRST RECORD OF WHITE MONARCHS,  
DANAUS PLEXIPPUS (L.) FORM NIVOSUS (LEPIDOPTERA:  
NYMPHALIDAE: DANAINAE) FROM VANUATU**

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### Abstract

The only previously known established population of white monarch butterflies, *Danaus plexippus* (L.) form *nivosus* Gunder, is that found on the Hawaiian island of Oahu. This paper records a second established population, restricted to the island of Aneityum (= Anatom), Vanuatu. The discovery of this second population provides the first opportunity for hybridization experiments which may shed light on the origin of the 'nivosus' gene.

### Introduction

The 'white' form of *Danaus plexippus* (L.), known as *nivosus* Gunder, is a conspicuous morph in which the normal bright orange of the wings is replaced by white that is slightly tinted pink or grey. For the most part this is a rare phenotype, although it became increasingly abundant on the Hawaiian island of Oahu before declining (Stimson and Kasuya 2000). Other isolated records listed by Vane-Wright (1993) are from Washington D.C., Missouri, Pennsylvania and the coast of California in continental USA, plus the North Island of New Zealand, Ambon and Seram in the Moluccas, Indonesia and Brisbane, Australia. We are aware of one further record recently published (Minno 1996), which added two records from Florida.

### The Vanuatu population

*Material examined.* VANUATU: 6 ♂♂, 6 ♀♀, Umeg, Aneityum, May, June, 1994, Fr A. Sacco.

Around 25 years ago, Fr Albert Sacco first noted the occasional white monarch at Anelghowhat on the SW coast of Aneityum (= Anatom), the southern-most island of the island chain that makes up Vanuatu. Some years later, white monarchs frequently were seen and collected by Fr Sacco at Umeg (= Umetch) on the SE coast of Aneityum, where they flew together with the orange form in a field where milkweed, *Asclepias* sp., was abundant. Form *nivosus* is now estimated by Fr Sacco to comprise around 20% of the *D. plexippus* population on Aneityum. Samson (1983) recorded *D. plexippus* from Aneityum but made no mention of a white form. No intermediate individuals between the white and orange forms have been noted.

Despite extensive observations of butterflies by Fr Sacco on other islands of Vanuatu, extending over more than 40 years of residency, form *nivosus* has not been sighted on any other island. Nor was form *nivosus* sighted by one of us (RBL) while collecting during the summer of 1987/88 on Efate, Ambrym and Malekula, and during September/October 1989 on Espiritu Santo.

All specimens of *nivosus* collected or sighted on Aneityum (Figs 1-2) were pinkish-white, unlike those from Hawaii which are nearly all grey-white. Only three specimens of the pinkish-white version are known from Hawaii (J. Stimson, pers. comm.).

### Discussion

The Vanuatu population is particularly significant because it is the only known established population of white monarchs apart from that in Hawaii. All other records involve chance encounters with single specimens rather than discernable populations. The size of the Vanuatu population (around 20% of the total *D. plexippus* population) is greater than that of Hawaii, which in 1988-89 reached its maximum density of approximately 8% (Stimson and Kasuya 2000), confirming that the Vanuatu population has been established for some years. The white monarchs of Hawaii were first noticed in 1965 (Mitchell 1966), at which time they were estimated at around 1% of the local population. This would suggest that the Vanuatu population may have established somewhere between 30-40 years ago and long after the establishment of monarchs through the Pacific islands in the latter half of the 19th century (Vane-Wright 1993).

One wonders why white monarchs have established colonies only on Oahu Island (Hawaii) and Aneityum Island (Vanuatu). It may well be a direct consequence of inbreeding the trait due to isolation. Stimson and Meyers (1985) have shown that form *nivosus* is the result of a simple autosomal recessive allele. If the populations of *D. plexippus* on Oahu and Aneityum Islands have few or no immigrant individuals, then inbreeding could easily increase the percentage of form *nivosus* individuals, providing that natural selection does not operate to eliminate homozygotes. Indeed, Stimson and Meyers (1985) hypothesised that the survival of white monarchs on Oahu is most likely because they are not at a selective disadvantage to the orange morph in the presence of bird predators. However, a more recent change in the behaviour of birds to seeking out larvae may now be a cause for the percentage decline in the number of white monarchs on Oahu (Stimson and Kasuya 2000).

The discovery of the Vanuatu population of white monarchs provides an opportunity for hybridization experimentation between the Hawaiian and Vanuatu populations, which for the first time may shed light on the origin of the 'nivosus' gene. As Vane-Wright (1993) noted, if double heterozygous crosses of different origins produce an F1 population of only typical orange *D. plexippus*, then independent origins for form *nivosus* can be rejected. However, if the F1 population segregates into 3:1 then a single American origin is plausible, although this would not reject a multiple-origin possibility.



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**Figs 1-2.** *Danaus plexippus*, form *nivosus*. (1) male upperside; (2) male underside.

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